CLAIMS:

1. A method of creating a field electron emission material, comprising the step of disposing vanadium or a vanadium compound in respective locations of a substrate in order to create a plurality of emission sites at said locations, at an average density of at least 10^2 cm^{-2}.

2. A method according to claim 1, wherein said vanadium or vanadium compound is in the form of particles.

3. A method according to claim 1 or 2, including:

   a. an application step of applying a vanadium-containing material to said substrate; and

   b. a processing step of processing the vanadium-containing material after application to said substrate, in order to create said emission sites.

4. A method according to claim 3, wherein said processing step includes heating said vanadium-containing material.

5. A method according to claim 4, wherein said processing step includes heating said vanadium-containing material to a temperature in the range 100 to 1000 °C.

6. A method according to claim 4, wherein said processing step includes heating said vanadium-containing material to a temperature in the range 300 to 800 °C.

7. A method according to claim 4, wherein said processing step includes heating said vanadium-containing material to a temperature in the range 500 to 550 °C.

8. A method according to claim 5, 6 or 7, wherein said processing step includes maintaining said temperature for a period in the range 5 to 300 minutes.

9. A method according to claim 5, 6 or 7, wherein said processing step includes maintaining said temperature for a period in the range 5 to 60 minutes.

10. A method according to claim 5, 6 or 7, wherein said processing step includes maintaining said temperature for a period in the range 10 to 30 minutes.

11. A method according to any of claims 3 to 10, wherein said processing step includes forming whiskers of said vanadium or vanadium compound.

12. A method according to any of claims 3 to 11, wherein said application step includes printing said vanadium-containing material directly or indirectly onto said substrate.

13. A method according to claim 12, wherein said application step includes printing said vanadium-containing material onto a cathode track on said substrate.

14. A method according to claim 12, wherein said application step includes printing said vanadium-containing material onto a resistive layer on said substrate.

15. A method according to any of claims 3 to 14, wherein said vanadium-containing material comprises an organometallic compound and a vanadium compound.

16. A method according to claim 15, wherein said organometallic compound contains one or more metal selected from gold, palladium and platinum.

17. A method according to claim 15 or 16, wherein said vanadium-containing material contains 0.01 to 10 wt% of vanadium with respect to the metal part of the organometallic compound.

18. A method according to claim 15 or 16, wherein said vanadium-containing material contains 0.5 to 5 wt% of vanadium with respect to the metal part of the organometallic compound.

19. A method according to claim 15 or 16, wherein said vanadium-containing material contains 0.8 to 2.5wt% of vanadium with respect to the metal part of the organometallic compound.

20. A method according to any of claims 3 to 19, wherein said vanadium-containing material comprises vanadium naphthenate oxide.

21. A method according to any of claims 3 to 20, wherein said vanadium-containing material contains material to create both said emission sites and a layer upon which said emission sites are disposed.

22. A method according to claim 21, wherein said layer provides an electrode.

23. A method according to claim 21, wherein said layer provides a resistive layer to serve as a ballast resistor.

24. A method according to claim 21, 22 or 23, wherein said processing step comprises processing the vanadium-containing material under such conditions as to create said layer and said emission sites concurrently.

25. A method according to claim 21, 22 or 23, wherein said processing step comprises processing the vanadium-containing material under first conditions such as to create said layer and subsequently under second conditions such as to create said emissions sites on said layer.

26. A method according to any of claims 3 to 25, wherein said processing step is carried out concurrently with a sealing step in which the field electron emission material is sealed within a field electron emission device.

27. A method of creating a field electron emission material, comprising the steps of disposing a metal oxide upon a substrate and processing the metal oxide in such conditions as to grow whiskers from the metal oxide at

locations on said substrate, thereby to create a plurality of emission sites at said locations.

28. A method according to claim 27, wherein said emission sites have an average density of at least 10^2 cm^{-2}

29. A method according to claim 27 or 28 and also according to any of claims 1 to 26.

30. A method of creating a field electron emission material, the method being substantially as hereinbefore described with reference to the accompanying drawings.

31. A field electron emission material that has been created by a method according to any of the preceding claims.

32. A field electron emission material comprising vanadium or vanadium compound applied to respective locations of a substrate in order to create a plurality of emission sites at said locations, at an average density of at least 10^2 cm^{-2}.

33. A field electron emission material according to claim 32, wherein said vanadium or vanadium compound is in the form of a plurality of particles.

34. A method or material according to any of the preceding claims, wherein said vanadium compound is selected from the group comprising vanadium oxide, vanadium silicide, vanadium nitride, vanadium silicate, vanadium carbide, vanadium boride, vanadium sulphide and vanadium titanate.

35. A method or material according to any of the preceding claims, wherein the distribution of said sites over the field electron emission material is random.

36. A method or material according to any of the preceding claims, wherein said sites are distributed over the field electron emission material at an average density of at least 10^3 cm^{-2}, 10^4 cm^{-2} or 10^5 cm^{-2}.

37. A method or material according to any of the preceding claims, wherein the distribution of said sites over the field electron emission material is substantially uniform.

38. A method or material according to claim 37, wherein the distribution of said sites over the field electron emission material has a uniformity such that the density of said sites in any circular area of 1mm diameter does not vary by more than 20% from the

average density of distribution of sites for all of the field electron emission material.

39. A method or material according to claim 38, wherein the distribution of said sites over the field electron emission material when using a circular measurement area of 1 mm in diameter is substantially Binomial or Poisson.

40. A method or material according to claim 37, wherein the distribution of said sites over the field electron emission material has a uniformity such that there is at least a 50% probability of at least one emitting site being located in any circular area of 4 μm diameter.

41. A method or material according to claim 37, wherein the distribution of said sites over the field electron emission material has a uniformity such that there is at least a 50% probability of at least one emitting site being located in any circular area of 10 μm diameter.

42. A field electron emission material substantially as hereinbefore described with reference to the accompanying drawings.

43. A field electron emission device comprising a field electron emitter containing a field electron emission material according to any of claims 31 to 42, and means for subjecting said emitter to an electric field in order to cause said emitter to emit electrons.

44. A field electron emission device according to claim 43, comprising a substrate with an array of patches of said field electron emitters, and control electrodes with aligned arrays of apertures, which electrodes are supported above the emitter patches by insulating layers.

45. A field electron emission device according to claim 44, wherein said apertures are in the form of slots.

46. A field electron emission device according to any of claims 43 to 45, comprising a plasma reactor, corona discharge device, silent discharge device, ozoniser, an electron source, electron gun, electron device, x-ray tube, vacuum gauge, gas filled device or ion thruster.

47. A field electron emission device according to any of claims 43 to 46, wherein the field electron emitter supplies the total current for operation of the device.

48. A field electron emission device according to any of claims 43 to 47, wherein the field electron emitter supplies a starting, triggering or priming current for the device.

49. A field electron emission device according to any of claims 43 to 48, comprising a display device.

50. A field electron emission device according to any of claims 43 to 48, comprising a lamp.

51. A field electron emission device according to claim 50, wherein said lamp is substantially flat.

52. A field electron emission device according to any of claims 43 to 51, wherein said emitter is connected to an electric driving means via a ballast resistor to limit current.

53. A field electron emission device according to claims 44 and 52, wherein said ballast resistor is applied as a resistive pad under each said emitting patch.

54. A field electron emission device according to any of claims 43 to 53, wherein said emitter material and/or a phosphor is/are coated upon one or more one-

dimensional array of conductive tracks which are arranged to be addressed by electronic driving means so as to produce a scanning illuminated line.

55. A field electron emission device according to claim 54, including said electronic driving means.

56. A field electron emission device according to any of claims 43 to 55, wherein said field emitter is disposed in an environment which is gaseous, liquid, solid, or a vacuum.

57. A field electron emission device according to any of claims 43 to 56, comprising a cathode which is optically translucent and is so arranged in relation to an anode that electrons emitted from the cathode impinge upon the anode to cause electro-luminescence at the anode, which electro-luminescence is visible through the optically translucent cathode.

58. A field electron emission device, substantially as hereinbefore described with reference to the accompanying drawings.